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(56) Documents Cited  
EP 0693761 A1 EP 0619588 A1 EP 0490023 A1  
US 5488210 A US 5457297 A US 5278372 A  
US 5268545 A

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UK CL (Edition O ) H1N  
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## (54) Keyboard switch

(57) A keyboard switch comprises first and second movable elements (20,30) engaged with each other and connected between a keycap (12) and a keyseat (11). The first and second elements (20,30) are provided with interengageable pressing boards (25,34), and interengageable slots (24) and shafts (33). When the keycap (12) is pressed at any position thereof, the keycap (12) will move downwardly in a well balanced and stable manner. When the key cap (12) is released, it will return to its original position as a result of an elastic rubber pad mounted within the keyseat (11).

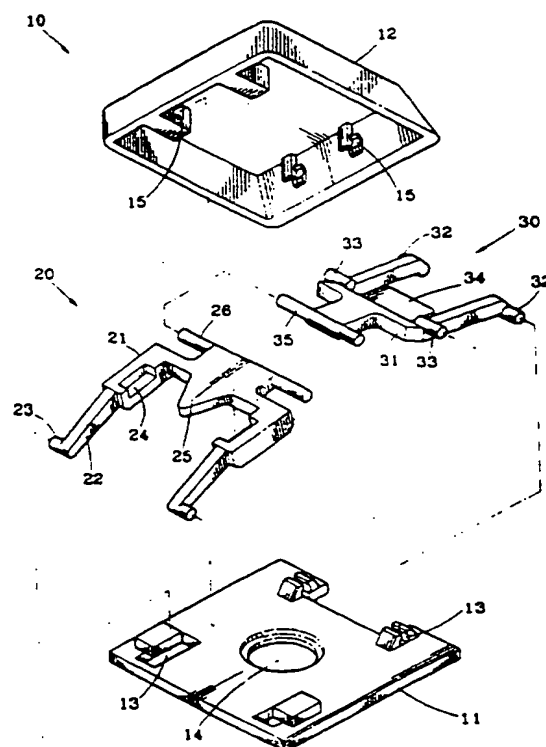


FIG. 1

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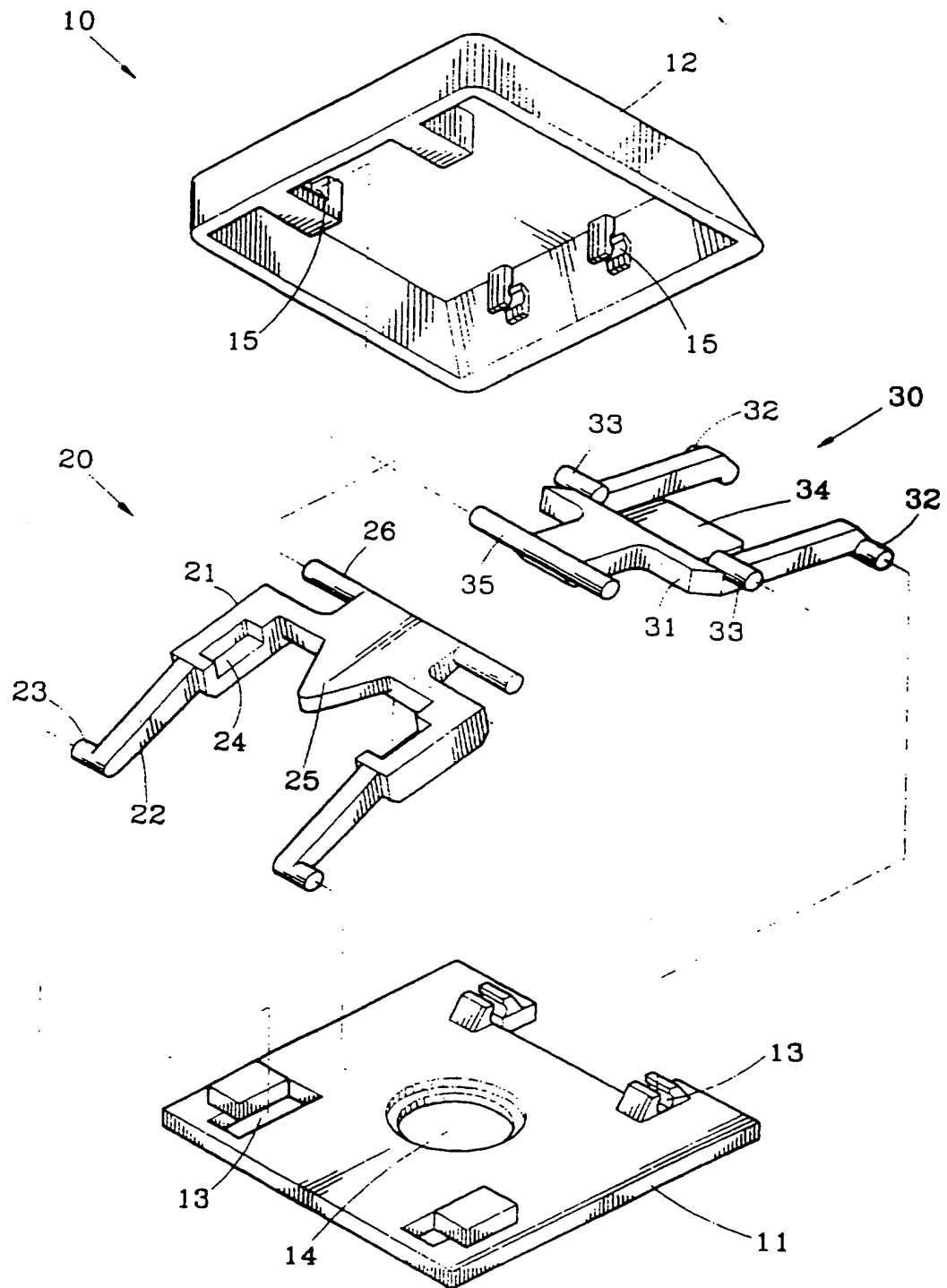


FIG. 1

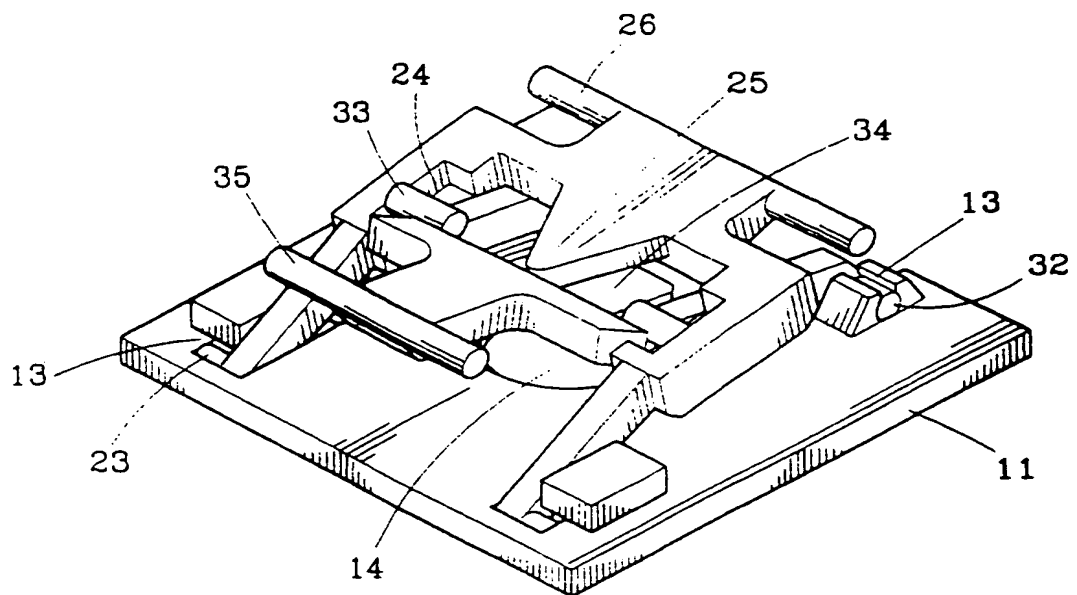


FIG. 2

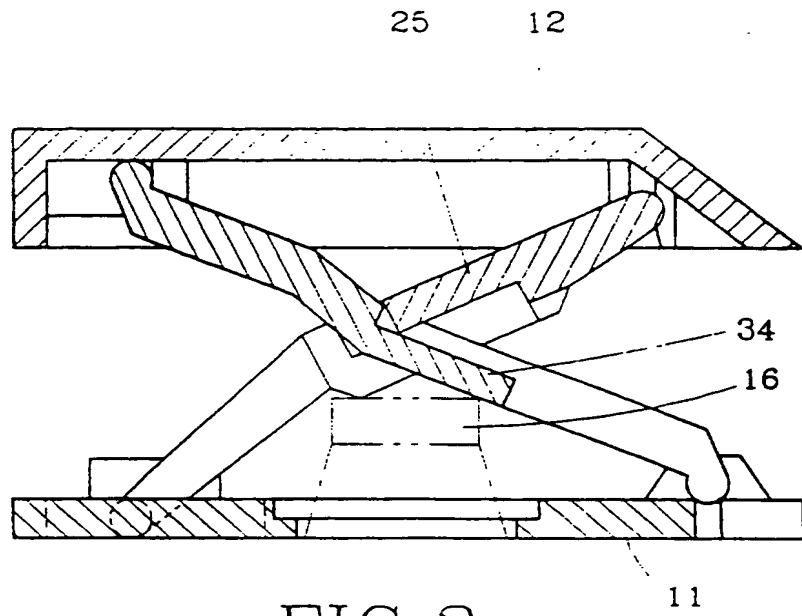


FIG. 3

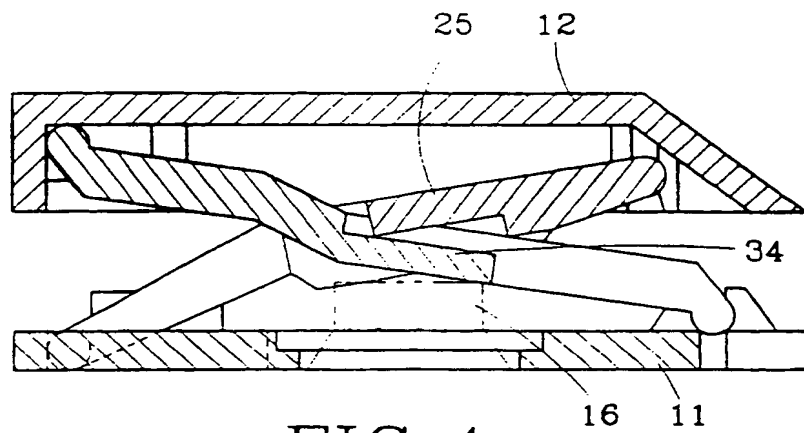


FIG. 4

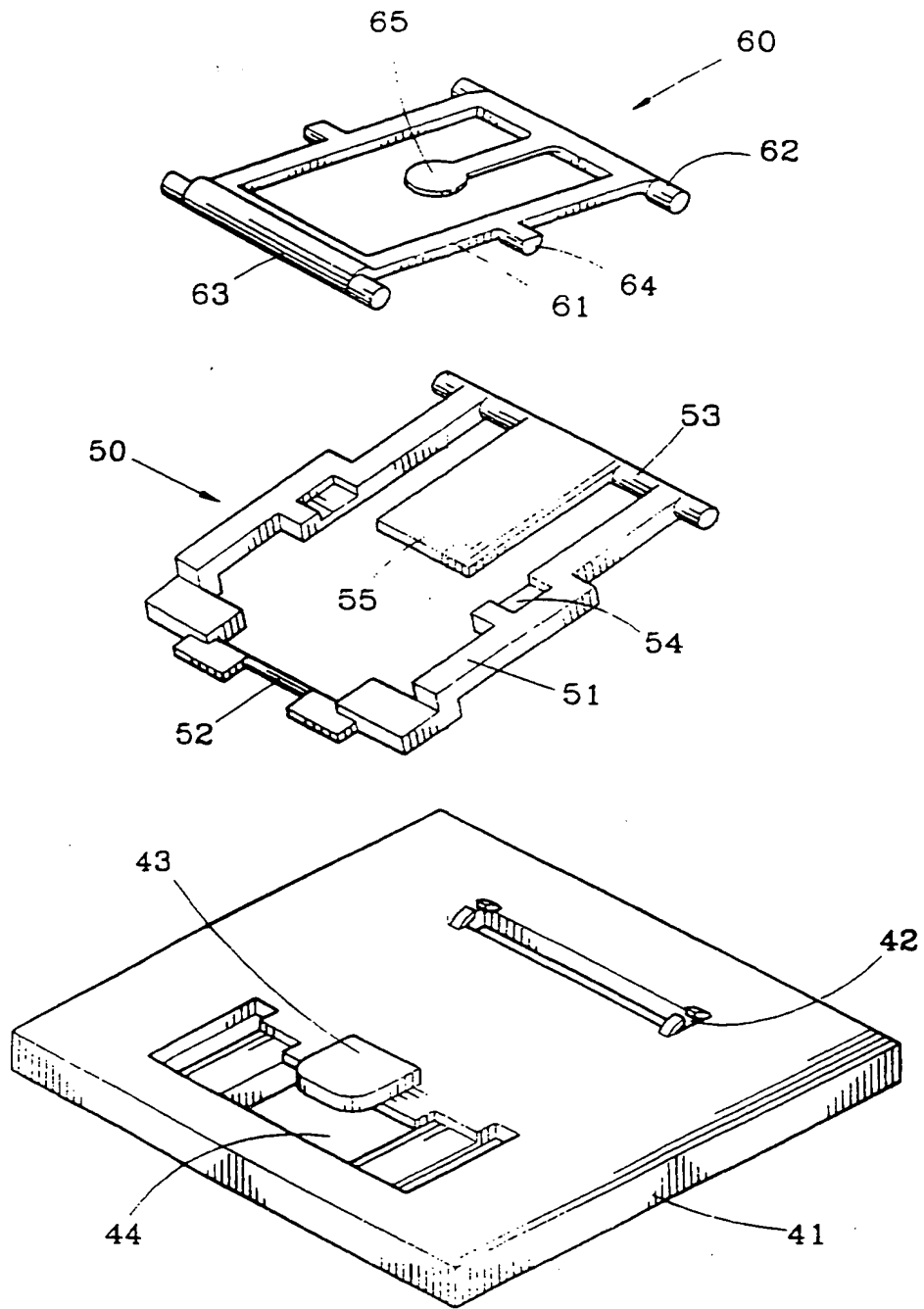


FIG.5

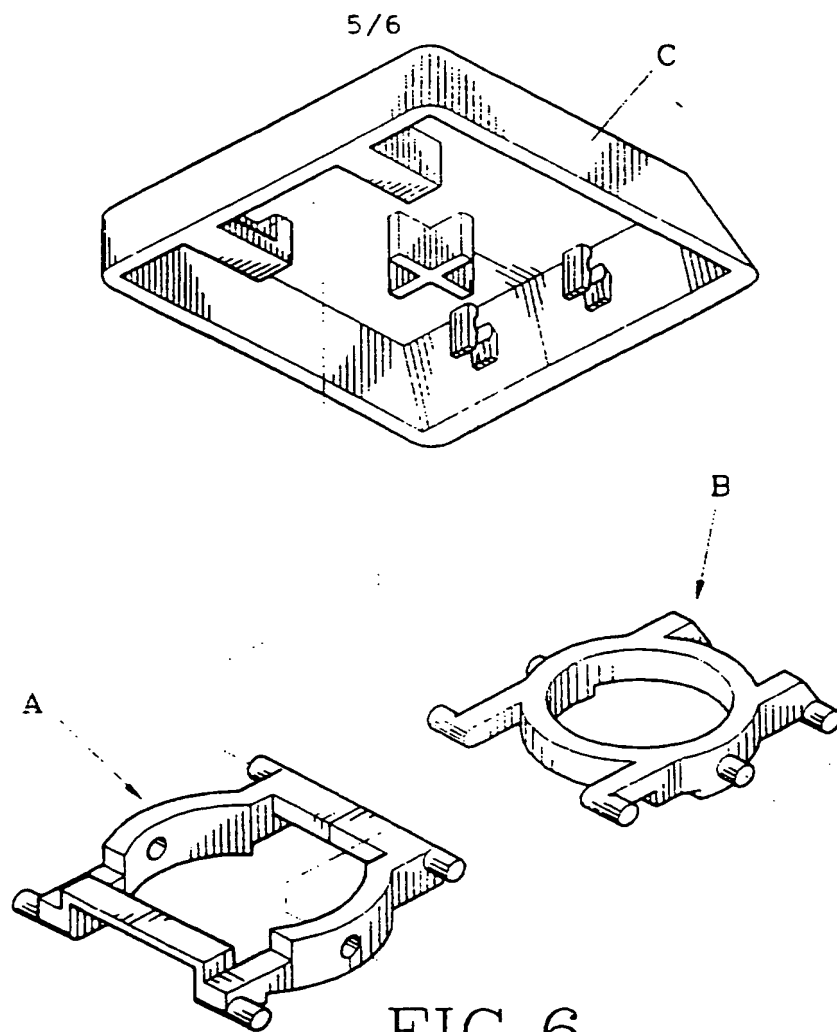


FIG. 6

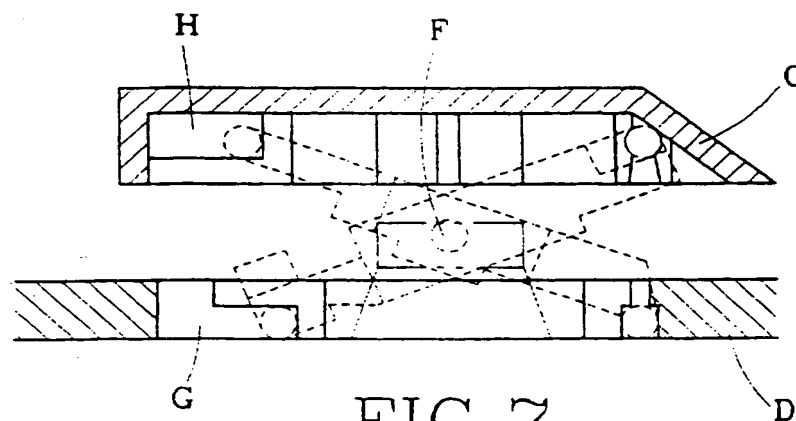


FIG. 7



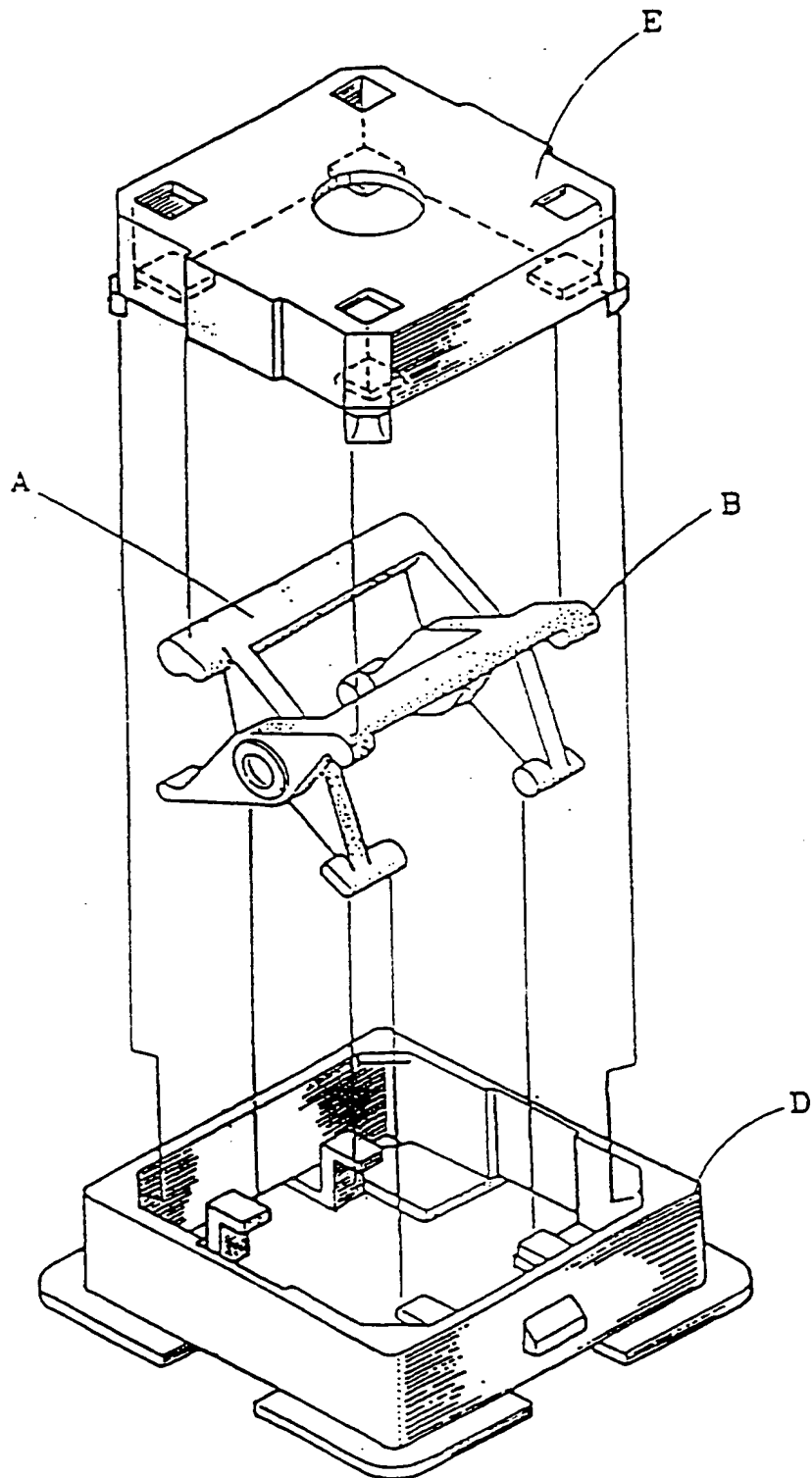


FIG - 8

## KEYBOARD SWITCH

The present invention relates to a keyboard switch, in particular, to a switch having corresponding pressing board to trigger the protruded shaft of the first element and the slot of the second element. These two elements are alternately engaged and located in between a keyseat and a keycap. The keyboard switch provides a stable and balanced downward movement of the keycap.

Conventional type of keyboard switch has a cylindrical rod extended from the inner edge of the keycap to retractably trigger the electrical contact. Due to the restriction of the structure, if the contact surface between the bottom seat and the cylindrical rod is small, the cap may easily incline and the key may not be stable. As a result, a bigger contact surface is needed to balance the keycap. However, a thinner and smaller size computer is more and more needed for the users. Increasing the contact surface and the distance of the movement of the keycap will be affect the thickness of the keyboard. This will not comply with the requirements of a small size computer. Besides, the stability of the downward movement may not be improved. As a result, it is imperative to improve the structure of the keyboard switch by shortening the downward movement of the keycap.

In another prior art, at the bottom end of the keycap, an alternate supporting frame is used to support the cap in order to provide a smaller and shorter downward movement of the keycap. For instance, as shown in Figs. 6 and 7, in which a pair of frames A and B are used to support in between the cap C and seat D. Frames A and B are interconnected at a pivot F. A gap H is provided in the cap C and a gap G is provided in the seat D for the sliding of the ends of the frames A and B when the frames A and B move. When the cap C is pressed downward, the downward distance of the cap C to the electrical contact at the bottom thereof is shortened. However, in this prior art, if the cap is pressed at different position thereof, the cap may be inclined and caused a biased downward movement of the cap. Thus, the electrical contact of the key may be poor.

In a further prior art which is shown in Fig. 8, a pair of square frames A and B are pivoted and located at key seat D. At the top of the frame, a slide key E is mounted. This slide key E is used for supporting the keycap. Thus, a switch is obtained. In this prior art, the slide key E is used to stabilize the sliding movement. However, as a result of the structure of the frames A and B, an imbalance downward movement is occurred if the

keycap is pressed at the side or the corner of the keycap. Thus, the electrical contact of the key is poor.

It would be desirable to be able to provide an improved keyboard switch, wherein first and second elements are alternatively engaged with each other and each element has a corresponding pressing plate to actuate with each other, so that a stable and balanced downward movement of the keycap is provided.

It would also be desirable to be able to provide an improved keyboard switch, wherein the stable and balance downward movement of the keycap will trigger the electrical contact of the key switch and avoid poor electrical contact of the key switch.

For best understanding of the nature of the present invention, the attached drawings show a preferred embodiment as an illustrative and nonlimitative example, to which drawings the description refers.

Fig. 1 is a perspective exploded view of the keyboard switch in accordance with the present invention;

Fig. 2 is a perspective view of the present invention;

Fig. 3 is a cross-sectional view of the keyboard switch before the keycap is pressed downward;

Fig. 4 is a cross-sectional view of the keyboard switch after the keycap is pressed downward and the elastic rubber pad triggers the electrical contact;

Fig. 5 is a perspective exploded view of a further preferred embodiment in accordance with the present invention;

Fig. 6 is a perspective view of a keyboard switch in prior art;

Fig. 7 is a cross-sectional view of Fig. 6; and

Fig. 8 is an exploded view of another keyboard switch in prior art.

As shown in Fig. 1, the keyboard switch 10 of the present invention comprises a first element 20 and a second element 30 alternately engaged and located onto a keyboard seat 11, a keycap 12 being supported at the top of the first and second

elements 20, 30.

The keyseat 11 comprises fastening slots 13 at the four corner of the seat 11 for the engagement of the pivoted shaft 23 of the first element 20 and the pivoted shaft 33 of the second element 30. At the center of the keyseat 11, a slot 14 is provided for the position of an elastic rubber pad 16 ( as shown in Figs. 3 and 4 ) of the electrical contact.

The keycap 12 comprises fastening slots 15 provided substantially at the inner edge of the four corners of cap 12 for the engagement of the horizontal shaft 26 of the first element 20 and the horizontal shaft 35 of the second element 30. When the first element 20 and the second element 30 are in engagement with the fastening slots 15 and fastening slots 13, a stable and balanced movement of the elements 20, 30 is obtained ( as shown in Fig. 2 ). Such structure will rigidly support the cap 12 at the top end thereof.

The first element 20 comprises a substantially open C-shaped body 21. The body 21 has two open ends with two protruded extensions 22. At the end of the extension 22, a pivoted pad 23 is provided for the engagement with a fastening slot 13 of the seat 11. At the inner edge of the ends of the body 21, a recess 24 is provided for receiving the protruded shaft 33 of the second element 30. At the inner edge of the body 21, a conical shaped pressing board 25 is provided, which corresponds to a pressing board 34 of the second element 30. A horizontal shaft 26 is provided at the center section of the external edge of the body 21 for the engagement with the fastening slot 15 of the cap 12.

The structure of the second element 30 is substantially similar to the first element 20. The second element 30 comprises a substantial open C-shaped body 31. The body 31 has two open ends with two pivoted ends 32 for the engagement with the fastening slot 13 of the seat 11. At the inner edge of the body 31, protruded shafts 33

overlie the two slots 24 of the first element 20. At the center region of the inner edge, a pressing board 34 is provided corresponding to the pressing board 25 of the first element 20. At the external edge of the body 31, a horizontal shaft 35 is provided for engagement with the fastening slot 15 of the cap 12.

The width of the second element 30 is smaller than that of the first element 20. In combination, the body 31 of the second element 30 is mounted within the space provided by the C-shaped body 21 of the first element 20. In this instance, the pressing board 25 of the first element 20 presses against the pressing board 34 of the second element 30, and the protruded shaft 33 of the second element 30 forms a pressing condition ( as shown in Fig. 2 ), such that a inter-restricting state is formed between the first and second elements 20 and 30.

As shown in Figs. 2, 3 and 4, when any position of the cap 12 is pressed, due to the inter-restricting action of the first and second element 20 and 30, the vertical movement of the cap 12 is a stable and well-balanced movement. That is, when the cap 12 is pressed

at the center thereof, due to the fact that the two horizontal shafts 26 and 35 are balancingly pressed, the first and second elements 20 and 30 move downward steadily and well balance<sup>d</sup>, and the pressing board 34 presses the elastic rubber pad 16 to connect with the electrical contact. If the position at which the pressure exerted is at the lateral side of the keycap 12, or are one corner, due to the horizontal shaft 26 being pressed, pressing board 25 touches the pressing board 34 of the second element 30, such that the first element 20 and the second element 30 can move downward steadily and well balance<sup>d</sup>. If the pressing end causes the horizontal shaft 35 to move the protruded shaft 33, and the slot 24 of the first element 20 is triggered, the first element 20 and the second element 30 will also move downward steadily and well balance, such that the keycap 12 will never incline to one side.

When the keycap 12 is release<sup>d</sup>, the elastic rubber pad 16 within the slot 14 of the key seat 11 will uplift the first element 20 and the second element 30, and the keycap 12 will steadily restore to its original position.

As shown in Fig. 5, there is shown another preferred embodiment of the present invention. In the preferred embodiment, the square shaped first and second element do not affect their function.

As shown in Fig. 5, the keyboard switch 40 comprises a keyseat 41 having a horizontal slot 42 and a slot 44. A blocking plate 43 is provided at the edge of the slot 44. The slots 42 and 44 are respectively engaged with the horizontal shaft 52 of the first element 50 and the horizontal shaft 62 of the second element 60.

The first element 50 comprises a substantially square shaped body 51 having a horizontal shaft 52 at the bottom end thereof for the engagement with the slot 44 of the keyseat 41. The blocking plate 43 is used to position the horizontal shaft 52. The upper end of the body 51 is provided with a horizontal shaft 53 for the engagement with the fastening slot ( not shown ) of the keycap. At the two lateral sides of the body 51, slots 54 are respectively provided thereto for receiving the protruded shaft 64 of the second element 60. At the top end of the horizontal shaft 53, a protruded pressing board 55 is provided for the pressing of the board 65 of the second element 60.

The structure of the second element 60 is substantially similar to that of the first element 50. The second element 60 has a square shaped body 61. The bottom end of the body 61 is provided with a horizontal shaft 62 for engagement with the horizontal fastening slot 42 provided at the keyseat 41. The upper end of the body 61 is provided with a horizontal shaft 63 for the engagement with the fastening slot within the keycap. At the two lateral sides of the body 61, outwardly protruded shafts 64 are provided. The shafts 64 overlie the slots 54 of the first element 50. At the bottom end of the horizontal shaft 62, a protruded pressing board 65 is provided for the blocking of the bottom end of the board 55 of the first element 50.

In the preferred embodiment, the width of the body 61 of the second element 60 is slightly smaller than the body 51 of the first element 50. In combination, the body 61 of the second element 60 can be provided within the body 51 of the first element 50. Thus, the pressing board 55 of the first element 50 will press against the board 65 of the second element 60, and the protruded shafts 64 at the lateral sides of the body 61 engage within the slots 25 of the body 51, such that the first and second element 50 and 60 interlink.

When the keycap is pressed, it provides a stable and balanced downward movement.

In view of the above structure of the first and second element, it provides a very convenient and easy combination which is not easily damaged. In case, there is a breakdown in the element, it can be easily replaced rapidly with a new element.

Claims:

1. A keyboard switch comprising a keycap, a first element, a second element and a keyseat, the first and second elements being engaged and interlinked to each other and responding to the pressing of the keycap, the interlinking of said elements is formed between the keycap and the keyseat, such that the first and second elements steadily move upward and downward.
2. The keyboard switch as set forth in claim 1, wherein the first element is a C-shaped body having an opened end with a pair of protruded extensions, each of which is provided with a pivoted shaft end for the engagement with a corresponding slot provided at said keyseat, a pair of slot being formed within the C-shaped body for adaptation of a protruded shaft end provided at the second element, a conic shaped pressing board being provided at the inner of said first element corresponding to a pressing board of the second element, a horizontal shaft being at the external edge of the pressing board of the second element for the engagement to an engaging slot of the keycap.
3. The keyboard switch as set forth in claim 1, wherein the second element is a C-shaped body having a pair of extensions being provided with a pivoted shaft end for the engagement with the fastening slot at the keyseat, the central region of the body is provided with a pressing board which is corresponding to the conic shaped pressing board of the first element.
4. The keyboard switch as set forth in claim 1, wherein the first element is a square body having the bottom end thereof being provided with a horizontal shaft to engage with the fastening slot of the keyseat, the upper end of the body is provided with a horizontal shaft for the engagement with the fastening slot of the keycap, at the two sides of the body, fastening slots are provided for the engagement with the protruded shaft end of the second element, at the upper shaft end thereof, a pressing board is provided and is corresponding to the pressing board of the second element.
5. The keyboard switch as set forth in claim 1, wherein the second element is a square body having the bottom end thereof being provided with a horizontal shaft to engage with the fastening slot of the keyseat, the upper end of the body is provided with a horizontal shaft for the engagement with the fastening slot of the keycap, at the two sides of the body, protruded shaft ends are provided for the engagement with the fastening

slots of the first element, at the bottom shaft end thereof, a pressing board is provided for the blocking of the bottom end of the first element.

6. The keyboard switch as set forth in claim 1, wherein the width of the second element is smaller than that of the first element and the second element is positioned within the width of the first element, such that the pressing board of the first element presses the press board of the second element, and the protruded shaft of the second element is pressed against the fastening slot of the first element, such that the first and second element are in an interlinking combination.

7. A keyboard switch substantially as described with reference to and as illustrated by Figs. 1 to 5 of the accompanying drawings.



first and second elements move steadily downwardly with each other.

2. A switch as claimed in claim 1 in which the first element comprises a body portion of generally U-shape the free ends of the arms of which each carry a stub shaft thereon for location in corresponding recesses in the keyseat for pivotal and sliding movement therein, the transverse base of the body member comprising a shaft for location in corresponding receiving means in the keycap for pivotal movement therein.

3. A switch as claimed in claim 2 in which the second element comprises a body portion of generally U-shape the free ends of which each carry a stub shaft thereon for location in corresponding receiving means in the keyseat for pivotal movement therein, the transverse base of the body portion comprising a shaft for location in corresponding recesses in the keycap for pivotal and sliding movement therein.

4. A switch as claimed in claim 1 in which the first element comprises a body portion of generally rectangular shape one end of which comprises a shaft for location in a corresponding recess in the keyseat for pivotal and sliding movement therein, and the other end of which comprises a shaft for location in corresponding receiving means in the keycap for pivotal movement therein.

5. A switch as claimed in claim 5 in which the second element comprises a body portion of generally rectangular shape one end of which comprises a shaft for location in a corresponding receiving means in the keyseat for pivotal movement therein, and the other end of which comprises a shaft for

**Amendments to the claims have been filed as follows**

1. A keyboard switch comprising a keyseat, a keycap and first and second elements between the keyseat and the keycap, the first element including, at one end thereof, first pivot means for engagement with corresponding first receiving means in the keyseat, and, at the other end thereof, second pivot means for engagement with corresponding second receiving means in the keycap, the first element further including a pressing board therein intermediate said first and second pivot means, and a pair of laterally opposed recesses therein intermediate said first and second pivot means, the second element including, at one end thereof, third pivot means for engagement with corresponding third receiving means in the keyseat at the end of said keyseat remote from said first receiving means, and, at the other end thereof, fourth pivot means for engagement with corresponding fourth receiving means in the keycap at the end of said keycap remote from said second receiving means, the second element further including a pressing board thereon intermediate said third and fourth pivot means and underlying the pressing board of the first element, and shaft means at each side thereof for engagement in corresponding ones of said laterally opposed recesses in the first element, the first and second elements being interlinked such that, on depression of the keycap, the pressing board of the first element reacts against the pressing board of the second element to move said second element downwardly therewith, and the shaft means on the second element react against the laterally opposed recesses on the first element to move said first element downwardly therewith, whereby the

location in corresponding receiving means in the keycap for pivotal and sliding movement therein.

6. A switch as claimed in any one of claims 1 to 5 in which the lateral recesses in the first element are located one to each side of the pressing board of the first element, the shaft means on the second element being located one to each side of the pressing board of the second element.

7. A switch as claimed in any one of claims 1 to 6 in which the width of the second element is smaller than the width of the first element, the second element being positioned within the width of the first element such that the pressing board of the first element overlies and engages with the pressing board of the second element and such that the shaft means at each side of the second element overlies and engage with the laterally opposed recesses in the first element, thereby to interlink the first and second elements.

8. A keyboard switch substantially as described with reference to and as illustrated by Figs. 1 to 5 of the accompanying drawings.



Application No: GB 9614540.4  
Claims searched: 1-7

Examiner: Peter Corbett  
Date of search: 3 September 1996

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): H1N

Int Cl (Ed.6): H01H

Other:

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0693761 A1 (BROTHER) see Fig 1	1
X	EP 0619588 A1 (BROTHER) see Fig 3	1
X	EP 0490023 A1 (SIEMENS) see Fig 1	1
X	US 5488210 (ALPS) see Fig 3	1
X	US 5457297 (CHEN) see Fig 1	1
X	US 5278372 (BROTHER) see Fig 1	1
X	US 5268545 (LEXMARK) see Fig 2	1

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